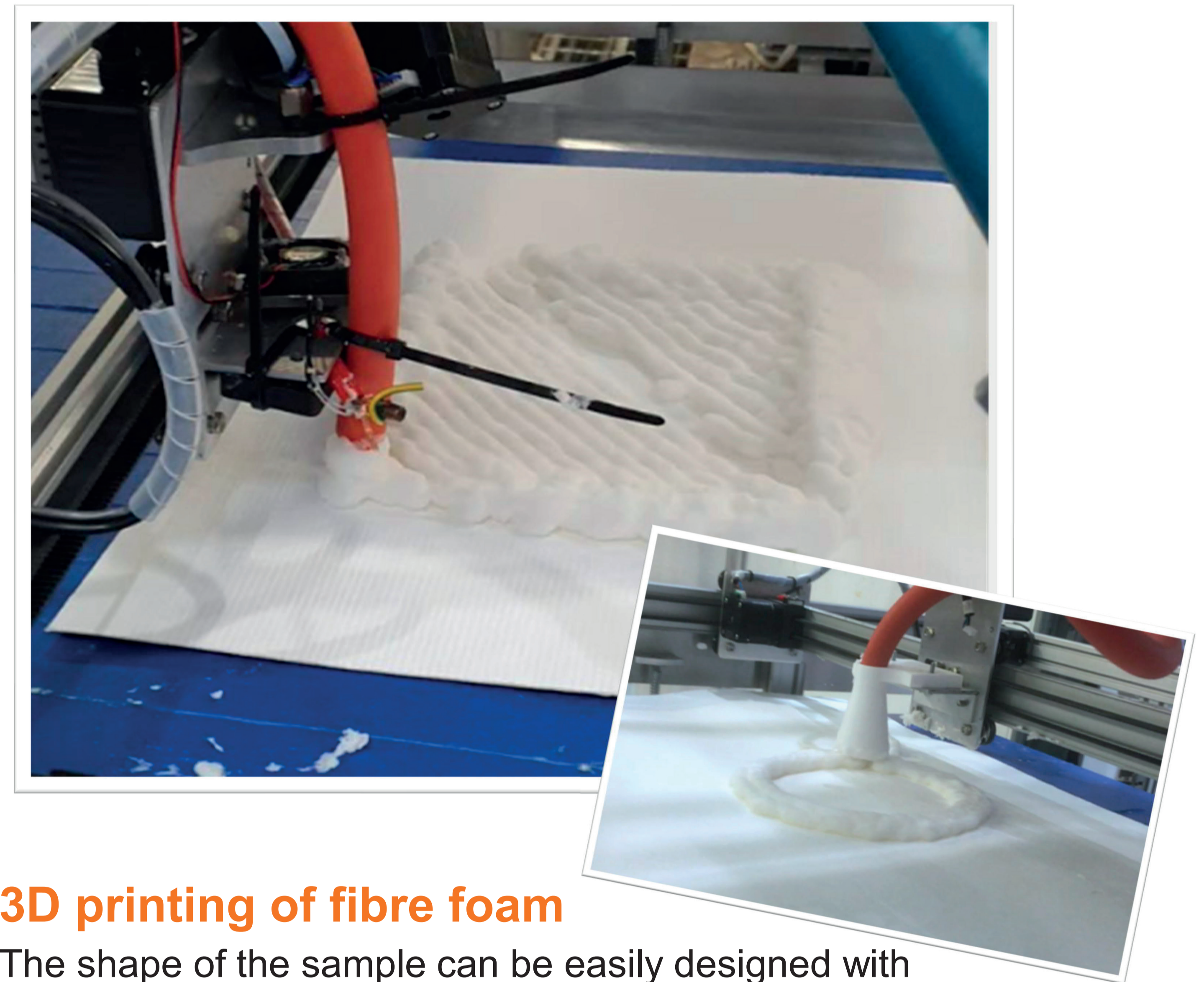


New opportunities with 3D printing of fibre foam

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Introduction

3D printing of fibre foam in a compact manufacturing line enables intensified and flexible production of e.g. advanced fibre-based cushioning and insulation components. This concept will allow the full use of modern rapid design and manufacturing technologies for production of functional components. It is expected to result in improved resource and energy efficiency, less waste generation and lower operating costs.



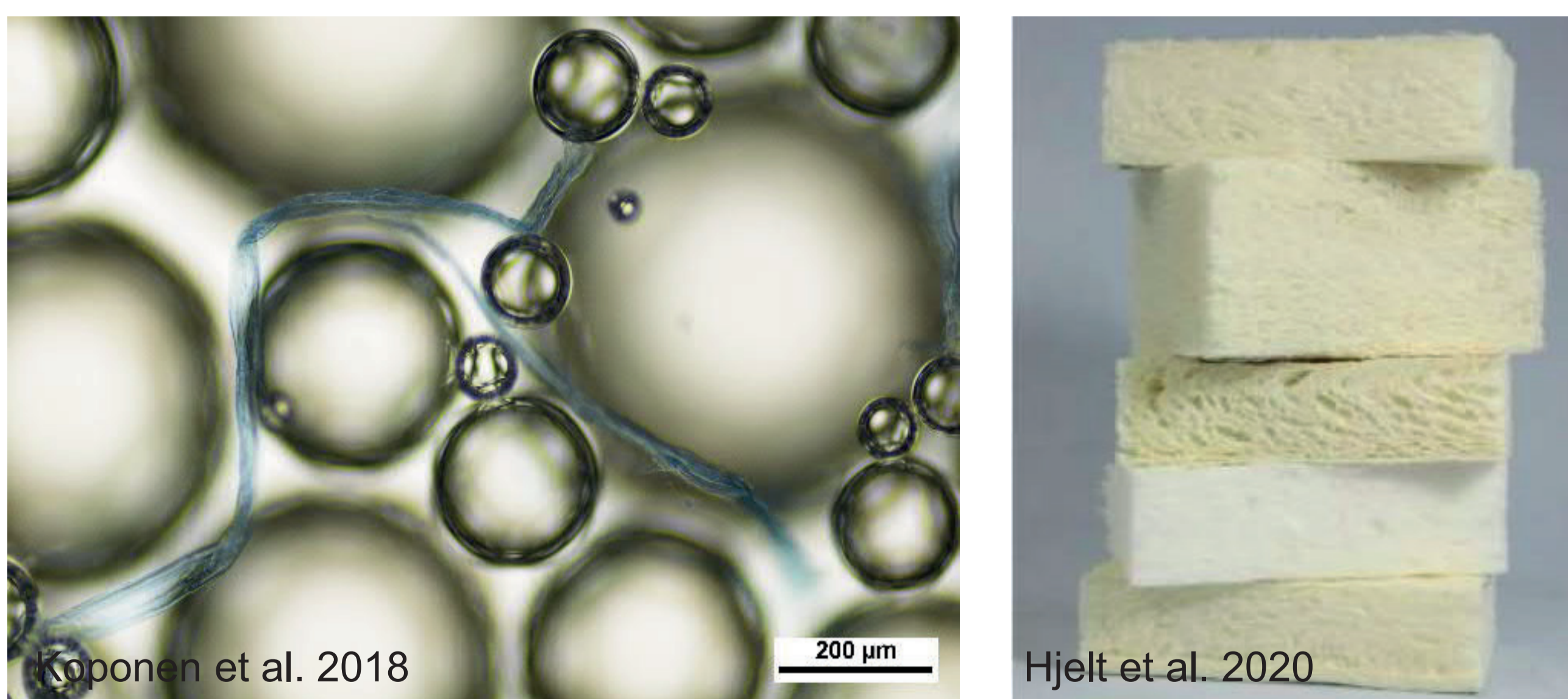
Fibre foam

In the manufacture process of fibre foam for 3D printing, cellulose or synthetic fibres are foamed with surfactant in high shear rate mixing. Foam generation is feasible in small and large scale industrial production.



Foam generation in VTT's lab and pilot environments. Hjelt et al. 2020

Foam keeps fibres uniformly distributed in the product and enables manufacture of low density fibre structures. Conventional chemical additives can be applied to improve e.g. cushioning or wet strength characteristics of the bulky fibre product.

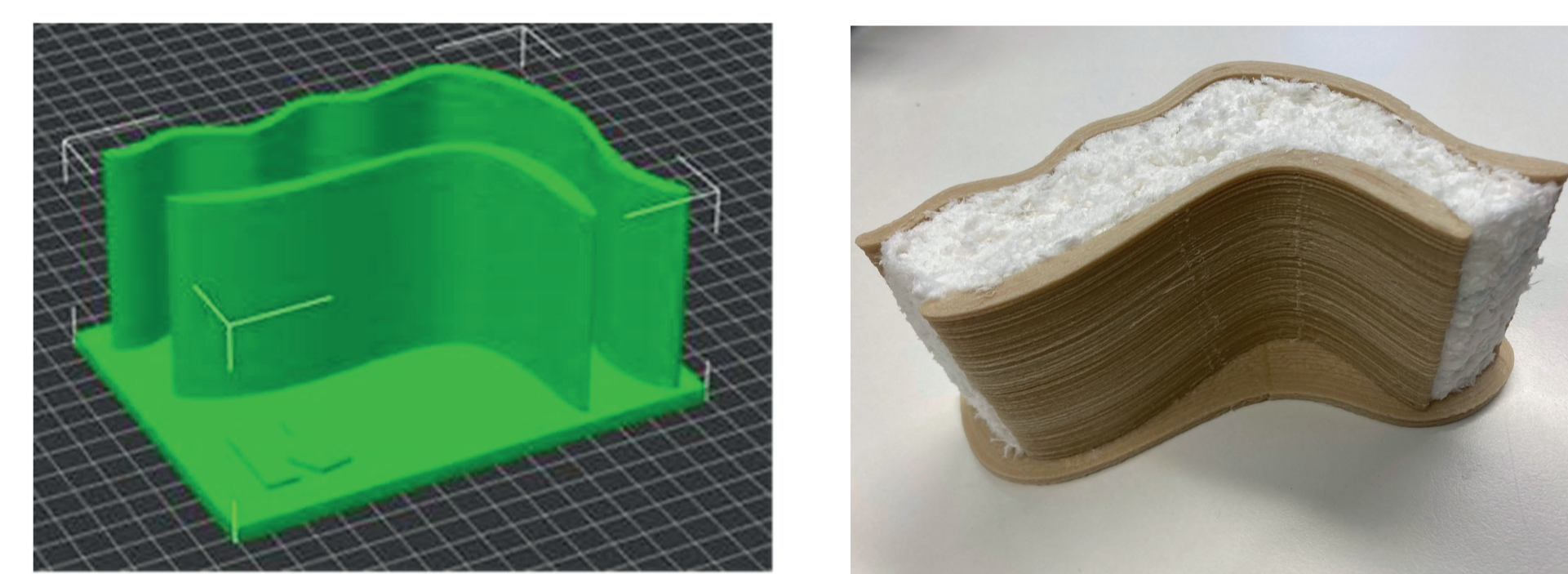


Koponen et al. 2018

Hjelt et al. 2020

3D printing of fibre foam

The shape of the sample can be easily designed with available programs.



In the 3D printing process wet fibre foam is pumped through a nozzle hose to the printer and the 3D structure will be printed automatically from bottom to top. Once ready, the sample is dried and possibly post-treated.

References

Hjelt, T., Ketoja, J., Kiiskinen, H., Koponen, A., Pääkkönen, E. (2020) Foam forming of fiber products: a review. *Journal of Dispersion Science and Technology*. <https://doi.org/10.1080/01932691.2020.1869035>

Koponen, A.; Jäsberg, A.; Lappalainen, T.; Kiiskinen, H. (2018) The Effect of in-Line Generation of Foam on the Foam Quality and the Sheet Formation in Foam Forming. *Nord. Pulp Pap. Res. J.* 33, 482–495. DOI: 10.1515/npprj-2018-3051.

Conclusions

- Capability to produce personalized, complex-shaped, and lightweight e.g. filter, insulation or decorative products
- Enables flexible production with reduced waste production
- Possible to use sustainable fibres and strength aids
- Fast start-up and simple production line
- Multi-material printing possibility

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